(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 325 455 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89300501.7**

(22) Date of filing: **19.01.89**

(51) Int. Cl.4: **H 04 L 11/16**
G 07 F 9/08, G 07 F 17/34

(30) Priority: **22.01.88 JP 10931/88**

(43) Date of publication of application:
26.07.89 Bulletin 89/30

(84) Designated Contracting States:
AT CH DE FR GB LI

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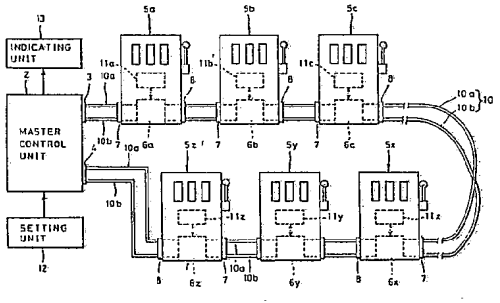
(54) Intercommunication method and system thereof.

(57) To control a plurality of apparatuses, the apparatuses and a master control unit having a communication unit are all connected for intercommunication in series through communication lines. One of the communication unit is used for exchanging messages between the master control unit and the apparatuses. Messages can transfer from one apparatus to another one in sequence. In another embodiment, the last apparatus is further connected with another communication unit of the master control unit, making a looped communication circuit. Therefore, messages sent out from one of the communication units of the master control unit can be received by the other communication unit to monitor the intercommunication. If a communication line is disconnected, messages can be also sent from another communication unit of the master control unit in reverse direction, making it possible to communicate with all of the apparatuses.

FIG. 1



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Description

INTERCOMMUNICATION METHOD AND SYSTEM THEREOF

The present invention relates to an intercommunication method and system thereof for communicating messages including data and commands in two-way between a master control unit (a central control unit) and each apparatus.

It has been well known to use a central control system in which a master control unit monitors and controls a plurality of apparatuses by connecting the master control unit and the apparatuses with communication cables in parallel. In this parallel-type central control system, messages are exchanged between the master control unit and the apparatuses in two-way through the communication cables, each of which comprises a plurality of signal lines including data bus and control signal lines. For example, casinos or game centers have a large number of slot machines which are connected to a master control unit with communication cables so as to control the operation of the slot machines and to gather the data such as the number of coins or tokens (which is hereinafter referred to merely as coins) inserted into each slot machine, the number of coins paid out for hits from each slot machines, and the number of games played in each slot machine.

There is a so-called progressive method for jack-pot hit processing ("jack-pot" is the greatest hit for a slot machine game). The parallel-type central control system is suitable especially for the jack-pot processing in this progressive method. In the progressive method, the number of coins to be paid out for a jack-pot hit continue to increase till the next jack-pot hit will occur, starting from zero. The details are as follows. When a master control unit controls a plurality of slot machines, for example, thirty slot machines as one group, the master control unit always accumulate amount of money corresponding to the number of coins inserted into each slot machine of the group. When a jack-pot hit occurs in one of the slot machines, the master control unit sends the slot machine a message including a command on the number of coins to be paid out. This number corresponds to a predetermined percentage of the increasing amount of money. Therefore, the number of coins to be paid out for a jack-pot hit is not fixed but varies every time. And whenever coins are paid-out for a jack-pot, the data of the accumulated amount of money is cleared to zero. Data such as the number of paid-out coins for every jack-pot hit are stored in the memory of the master control unit and indicated for monitoring on the display of the master control unit.

To communicate with the master control unit, a slave unit basically having a micro processor unit and a storing device is provided in every slot machine. These slave units and the master control unit are conventionally connected in parallel, resulting in provision of a lot of communication cables. When more slot machines are additionally placed, very long communication cables are necessary because the location for the added slot machine becomes inevitably farther away from the control unit according as the number of the slot machine increases. These long communication cables are subject to electrical noises and exposed to greater danger of disconnection. In summary, the conventional parallel-connection central control system has defects: one is that many long communication cables are necessary; and another is that if once a communication cable is disconnected, the corresponding slot machine is cut off from the master control unit, causing the slot machine to fall in out of control.

It is therefore an object of the present invention to provide an intercommunication method and system thereof, by which it is not necessary to provide long communication cables for connecting a master control unit and each apparatus even though the number of apparatuses is great.

It is another object of the present invention to provide an intercommunication method and system thereof, by which electrical noises and danger of disconnection are substantially reduced.

It is still another object of the present invention to provide an intercommunication method and system thereof, in which a master control unit and apparatuses are connected in a loop through communication cables so that the intercommunication can continue in reverse direction of the loop if a communication cable is disconnected.

For achieving this and other objects and advantages, according to the present invention, a plurality of apparatuses controlled by a master control unit are connected in series through communication cables and then the first apparatus is connected with the master control unit through a communication cable. Messages including data and commands are transmitted from the master control unit or from one of the apparatus through the communication cables to the apparatus to be controlled.

According to the present invention, because the master control unit and a plurality of apparatuses are all connected in series, long communication cable is not needed, reducing noises and danger of disconnection.

According to the preferred embodiment of the present invention, a master control unit has two communication units therein, to which the first and last apparatus connected in series are connected respectively, making a looped communication circuit. One of the communication units is made effective for the intercommunication, but even if intercommunication with part of the apparatuses becomes impossible due to disconncection of a communication cable, the intercommunication can continue by effecting the other communication unit alternatively instead of the communication unit which has been used. Therefore, messages can be sent from the master control unit to the apparatuses in reverse direction in the looped circuit.

According to another preferred embodiment of the present invention, an address is alocated to each

of the apparatuses. Each apparatus collates an address code included in a message from the master control unit with its own address code. Only an apparatus having an address specified by the address code in the message can receives the message and then performs an operation or operations according to instruction included in the message or send a message responding to the received message to the master control unit.

According to further embodiment of the present invention, each of apparatuses is provided with a slave unit having the first and second communication units, each of which comprises a transmitting device and a receiving device. The transmitting device of the first communication unit transmits message to the preceding slave unit and the receiving device of the first communication unit receives messages from the preceding slave unit. Similarly, the transmitting device of the second communication unit transmits message to the succeeding slave unit and the receiving device of the second communication unit receives message from the succeeding slave unit. The slave unit may have a function that, even if a message is received by the slave unit specified by the address code in the message, the message is transferred to its succeeding slave unit. In this case, the message sent from the effected communication unit of the master control unit can reach the another communication unit through all of the slave units including the specified slave unit. Therefore, the state of the intercommunication can be monitored and be checked for abnormality in real time.

These and other objects and features of the invention will be seen by reference to the following description, taken in connection with the accompanying drawing in which:

Figure 1 is a schematic view showing an embodiment of an intercommunication system according to the present invention;

Figure 2 is a block diagram showing a master control unit of the embodiment of Figure 1.

Figure 3 is a block diagram showing a slave unit of the embodiment of Figure 1.

Figure 4 is a time chart explaining sending/receiving of message between the slave unit and a slot machine control unit of the embodiment of Figure 1.

Figure 5 is a time chart explaining sending/receiving of message between the master control unit and the slot machine control unit through the slave unit.

Figure 6 is an illustration explaining basic format of a message used in communication by the embodiment of Figure 1.

Figure 7 is a command code table, the command code being including in message in communication by the embodiment of figure 1.

Figure 8 is an illustration explaining a data request message used in communication by the embodiment of Figure 1.

Figure 9 is an illustration explaining a coin data message used in communication by the embodiment of Figure 1.

Figure 10 is a time chart explaining the operation of switching of communication units of the embodiment of Figure 1.

Figure 11 is an illustration explaining a jack-pot occurrence message used in communication by the embodiment of Figure 1.

Figure 12 is an illustration explaining a jack-pot occurrence message used in communication by the embodiment of Figure 1.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the twelve views, Figure 1 shows a central control system for controlling slot machines, embodying the present invention. A master control unit 2 is provided with a pair of first and second connectors 3 and 4 having quite the same construction. Provided in a plurality of slot machines 5a, 5b, 5c, ---, 5x, 5y, and 5z are a plurality of slave unit 6a, 6b, 6c, ---, 6x, 6y, and 6z respectively, each having a pair of first and second connectors 7 and 8.

The first connector 3 of the master control unit 2 is connected with the first connector 7 of the slave unit 6a through a pair of communication line 10 comprising a transmitting cable 10a and a receiving cable 10b. The second connector 8 of the slave unit 6a is connected with the first connector 7 of the next slave unit 6b through the communication line 10. By repeating such connection with the communication line 10, all of the slave units 6a to 6z are connected in series. Next, the second connector 8 of the last slave 6z is connected with the second connector 4 of the master control unit 2 through the communication line 10. After all, the master control unit 2 and the slave unit 6a to 6z forms a looped communication circuit. Each of the slot machines 5a to 5z incorporates respective slot machine control units 11a, 11b, 11c, ---, 11x, 11y, 11z incorporating a micro processor for controlling their individual operation of the slot machines. Each of the slave units 6a to 6z sends and receives message including data and commands with the corresponding one of the slot machine control units 11a to 11z. There are provided with a setting unit 12 and a indicating unit 13 which are connected to the master control unit 2. The setting unit 12 includes a keyboard for entering data used for controlling the slot machines 5a to 5z. The indicating unit 13 can indicate the amount of money corresponding to the number of paid-out coins for a jack-pot (which is hereinafter referred to as a JP).

As shown in Figure 2, provided in the master control unit 2 are the first and second connectors 3 and 4, a micro processor unit (MPU) 15, first and second communication units 16 and 17, a monitoring unit 18, a selecting unit 19, a ROM 22, and a RAM 23. The first and second communication units 16 and 17 have the same structure and function that sends messages to the slave units 6a to 6z and receives messages therefrom. The first communication unit 16 is connected with the first connector 3 and provided with a transmitting device 16a and a receiving device 16b. The second communication unit 17 is connected with the second connector 4 and provided with a transmitting device 17a and a receiving device 17b. The monitoring unit 18 monitors the state of the communication by checking the

outputs of the first and second communication units 16 and 17 and outputs signals representing the state of the communication. According to the output of the monitoring unit 18, the selecting unit 19 selects one of the first and second communication units 16 and 17 and make it effective. Therefore, the communication with the slave units is carried out by only using one of the communication units 16 and 17.

In this embodiment, for optical communication, the transmitting devices 16a and 17a have light-emitting diodes 20a and 21a, and the receiving devices 16b and 17b have photo diodes 20b and 21b. It is to be noted that, as described before, only one of the communication units 16 and 17 is electrically effected by the selecting unit 19. The transmitting and receiving cables 10a and 10b are made of optical fiber cables. The ends of these cables 10a and 10b are connected to the connectors 3 and 4, fixing the end faces of the cables 10a and 10b so as to face the light-emitting diodes 20a and 21a and the photo diodes 20b and 21b.

Executing and processing programs for the communication are stored in the ROM 22 to operate the communication units 16 and 17 and the monitoring unit 18 in predetermined sequences and to rewrite the data stored in the RAM 23 according to data in messages from the slave units 6a to 6z.

Figure 3 shows the schematic diagram of the slave unit 6a which are the same as the other slave units 6b to 6z. Therefore, the explanation for the slave units 6a to 6z will be done only for the slave unit 6a. The slave unit 6a comprises a micro processor unit (MPU) 25, a first communication unit 26 having a receiving device 26a and a transmitting device 26b, a second communication unit 27 having a second receiving device 27a and a second transmitting device 27b, an address setting unit 28 for alocating an address to the slave unit 6a, a ROM 29, a RAM 30, and message checking unit 31. The ROM 29 stores a sequential-processing program for the slave unit 6a, according to which the micro processor unit 25 will operate. In the message checking unit 31, message from the slot machine control unit 11a are checked whether the message meets the condition of a predetermined format or not. This slot machine control unit 11a controls the sequence and processes of the games of the slot machine 5a and outputs data such as the number of inserted coins to the slave unit 6a for JP process in the progressive method.

The first and second receiving devices 26a and 27a have photo diodes 32a and 33b for receiving signals of messages respectively, and the first and second transmitting device 26b and 27a have light-emitting diodes 32b and 33a for transmitting signals of messages. The photo diodes 32a and 33b and the light-emitting diodes 32b and 33a are the same in specification as those used for the receiving and transmitting devices 16a, 16b, 17a, and 17b in the master control unit 2 which performs optical communication.

Next, the operation of the embodiment is described in detail when JP processing is performed in the progressive method. In this progressive method, the number of coins to be paid-out for a JP hit is determined according to a predetermined percentage, e.g., 10% of the amount of money corresponding to the accumulated number of coins which have been inserted into the slot machines 5a to 5z since the previous occurrence of a JP hit. The percentage may be set or changed with the setting unit 12 at any time.

Each of the slot machine control units 11a to 11z controls the each slot machine with respect to, in the order of operation sequence of the slot machine for a game, detection of insertion of coins; measurement of the number of inserted coins; detection of pulling of the slot machine start lever; operation of the start and stop of the slot machine reels; decision of whether the game is to be a hit or fail and of the kind of hit when the game has won a hit; operation of paying-out coins according to the kind of the hit when the game wins the hit. When coins are inserted for a game, the slot machine control unit generates and sends a coin data message to the slave unit. The coin data message comprises a series of several bytes including a start code for the first byte of 8 bits, a coin data code for an intermediate byte, and an end code for the last byte. The coin data is, concretely, the number of inserted coins.

Referring to Figure 3, the coin data message is sent to the message checking unit 31 of the slave unit 6a from the slot machine control unit 11a so as to be checked in format, and only when the coin data message is correct in format, the micro processor unit (MPU) 25 stores the data in the RAM 30. When the coin data message is judged to be incorrect in format, the microprocessor unit 25 refuses to receive the signal, and then the coin data is not stored in the RAM 30.

Figure 4 shows an example of message communication between the slave unit 6a and the corresponding slot machine control unit 11a. Only the communication with respect to the slave unit 6a is explained because communications of the other slave units 6b to 6z are the same as that of the salve unit 6a. When correctly receiving a coin data message from the slot machine control unit 11a, the slave unit 6a sends a normal receiving message to the slot machine control unit 11a. On the contrary, when incorrectly receiving a coin data message from the slot machine control unit 11, the slave unit 6a sends an error-receiving message to the slot machine control unit 11a. in this case, the slot machine control unit 11a again sends the same coin data message to the slave unit 6a. Further, when no normal receiving message is sent to the slot machine control unit 11a from the slave unit 6a for a predetermined time t_x, the slot machine control unit 11a sends the coin data message again. Such communication is also done between each of other slave units 6b to 6z and the corresponding one of the slot machine control units 11b to 11z and the data of the number of the inserted coins is stored in each of RAMs 30.

The message communication between the slave unit 6a and the master control 2 is illustrated in a time chart of the Figure 5. A message including data and commands are generally constructed according to a basic format shown in Figure 6. The message

consists of serial codes which are a start code (STX), an address code (ADR), a command code (CMD), a text (TXT), a check sum (CHS), and an end code (EXT), each being represented by combination of a binary digit "1" or "0". Each code consists of 8 bits except for the text (TXT).

A command code table is shown in Figure 7 in which upper four digits are listed in row and lower digits are in column. According to the table, the start code is represented by "02" in hexadecimal, e.g., "&H02", the end code is "&H03", the data request command is "&H20", and the coin data code is "&H30". The check sum (CHS) is obtained, first by making an exclusive OR operation in which each digit from the start code (STX) to the text (TXT) for each digit of lower seven bits is added eliminating their carries, and secondly by setting the most significant bit (MSB) "1". The check sum (CHS) obtained in this way is used, as is well known, to make sure that the message includes no error data.

The master control unit 2 periodically sends data request messages at a constant duration to the slave unit 6a according to a sequence program stored in the ROM 22. The structure of the data request message is schematically shown in Figure 8. In Figure 8, also their actual serial binary signals corresponding to the data request message are shown. For example, at the time corresponding to the binary signal "1", the light emitting diode 20a provided on the transmitting device 16a of the master control unit 2 will turns on. Therefore, the data request message and other messages are transmitted to the slave unit 6a in a form of a series of light on-and-off signals through the transmitting line 10.

As shown in Figure 8, when the address code in the data request message is "&H35", the address code &H35 specifies a slave unit having an address "5". When the slave unit 6a has an address "5", the slave unit 6a receives the data request message and in reply sends the coin data message including the number of the inserted coins, which is read from the RAM 30.

After the master control unit 2 have received the coin data message, the master control unit 2 sends a coin data confirmation message to the slave unit 6a to confirm whether the number is true or not. Then, the slave unit 6a collates the number of the inserted coins in the coin data confirmation message with the number of the inserted coins stored in the RAM 30. When the numbers coincides, the slave unit 6a sends a normal-receiving message to the master control unit 2 and simultaneously clears the data in the RAM 30. If the numbers do not coincide, an abnormal message is sent from the slave unit 6a to the master control unit 2, and again the same data request message is sent to the slave unit 6a.

The slave unit 6a transfers the data request message from the master control unit 2 to the next slave unit 6b, through the transmitting device 27a whether or not the address code in the data request message coincides with the address of the slave unit 6a. Similarly, the next slave unit 6b also transfers the data request message to the slave unit 6c. In this way, the data request message is transferred by all the slave units and finally, reaches the communication unit 17 of the master control unit 2, making a round of transmission in this looped communication circuit. By effecting the receiving device 17b of the second communication unit 17 while the first communication unit 16 is effective, the transmitting state of at least the communication cable 10a may be monitored by checking the outputs of the receiving device 17b by the monitoring unit 18.

A coin data message is schematically illustrated in Figure 9, in which, following a command code having a code "&H30" representing that this message is a coin data message, a text block having codes "&H31" and "&H35" representing the number of coins is shown. These data "&H31" and "&H35" mean that the number of inserted coins into the slot machine 5a is fifteen. The coin data message, as described before, is made of a series of light on-and-off signals by the light-emitting diode 32b in the transmitting device 26b to be sent to the photo diode 20b of the master control unit 2 through the communication cable 10b. The coin data message sent from the slave unit 6a is stored in the RAM 23 of the master control unit 2.

Next, the master control unit 2 sends a data request message having a different address code "&H36" specifying an address "6". In this time, the micro processor unit (MPU) 25 of the slave unit 6a refuses to receive the message by distinguishing that the specified address "6" differs from the address "5", and transfers the message as it is to the slave unit 6b through the transmitting cable 10a. If the alocated address of the slave unit 6b is "6", the slave unit 6b receives the message and then, in reply, transmits a coin data message as to the slot machine 5b, through the transmitting cable 10b to the slave unit 6a. The slave unit 6a receives the message at the receiving device 27b and transmits it as it is from the transmitting device 26b to the master control unit 2.

The master control unit 2, in this way, sends data request messages successively to the other slave unit 6c to 6z, varying the address code. The master control unit 2 can accordingly obtain the coin data, namely, the number of inserted coins, of the slot machines 5a to 5z. The number of inserted coins is stored in the RAM 23. Further, the master control unit 2 accumulates the number of coins inserted in all of the slot machines and stores in the RAM 23. Cyclically, the master control unit 2 continues to send data request messages successively to all of the slave units 6a to 6z, thus accumulating the number of coins in the RAM 23 until the next JP hit will occurs.

Due to disconnection of a cable connecting, for example, the slave units 6w and 6x, the message with an address code specifying the slave unit 6x can not reach the slave unit 6x. Hence, the master control unit 2 does not receive any coin data message from the slave unit 6x. As illustrated in Figure 10, if the monitoring unit 18 detects that no coin data message from any one of the slave units 6a to 6z has been received for a pre-fixed time Δt_y since a data request message was transmitted out from the master control unit 2, the selecting unit 19 makes

the second communication unit 17 effective alternatively instead of the first communication unit 16. Then, the same data request messages are transmitted through the transmitting device 17b in a reverse direction in the looped communication circuit, reaching the slave unit 6x. The slave unit 6x sends its coin data message in response from the transmitting device of the second communication unit 16 having the connector 8 to the second communication unit 17 of the master control unit 2. For next cycle of communication with the slave units, the first communication unit 16 is made effective again. In this way, even if a cable disconnection occurs in this system, the master control unit 2 can obtains messages from all of the slave units 6a to 6z by alternatively using both the first and second communication units 16 and 17 to continue the communication without suspention.

The time duration Δt_y is set to be a little longer than period from the time when the data request message is fed from the master control unit 2 until the time when the response message from a corresponding slave unit reaches the master control unit 2. An indicator may be provided to indicate which communication cable is disconnected. After re-connection of this communication cable, again the intercommunication by means of only the first communication unit 16 can continue.

Next, a sequence of message exchanging between the master control unit 2 and one of slot machine control units 6a to 6z will be explained as to when a JP hit occurs in the corresponding slot machine. If a JP hit takes place, for example, in the slot machine 5a, a message having data representing the occurrence of a JP hit is sent from the slot machine control unit 11a to the slave unit 6a in order to store the data in the RAM 30. When a data request message for the slave unit 6a is sent from the master control unit 2, the slave unit 6a sends a JP occurrence message, whose the schematic structure is illustrated in Figure 11. In the command code (CMD) and text (TXT) of this JP occurrence message, the data "&H31" is contained commonly.

The master control unit 2 receives the JP occurrence message and calculates the amount of money to be paid-out according to the predetermined percentage, for example, 10%, and the accumulated total number of the inserted coins, the number being stored in the RAM 23. Then, the master control unit 2 sends a JP data message which represents the amount of money to be paid-out to the slave unit 6a. An example of the JP data message is shown in Figure 12, in which the command code (CMD) "&H21" represents that this message is a JP data message and the text (TXT) "&H2550" represents that the amount of money is 2550 . The number digits of the text code (TXT) is previously set according to the maximum number of digits of the amount of money to be paid-out for a JP hit.

When this JP data message is supplied to the slot machine control unit 11a through the corresponding slave unit 6a, the slot machine control unit 11a stores the data of the amount of money to be paid out and sends a JP data confirmation message for confirming that the data is correctly sent from the master control unit 2. This message includes a command code (CMD) "&H33" representing a JP response and a text code representing the amount of money.

The master control unit 2 judges whether the text code in this JP data confirmation message is true or not by comparing with the data of the calculated amount of money to be paid-out. When the data is true, a JP occurrence confirmation message is fed to the slot machine control unit 11a through the slave unit 6a. Then, the slot machine control unit 11a re-confirms that a JP hit has surely occurred in this slot machine 5a and sends a JP confirmation response message to the master control unit 2 so that the master control unit 2 makes a final confirmation of the occurrence of a JP hit in the slot machine 5a.

After the final confirmation, the master control unit 2 sends a JP paying-out message to the slave unit 6a, which instructs the slot machine control unit 11a, upon reception of the JP paying-out message, to pay out coins according to the amount of money to be paid-out as specified in the JP data message. After the actual paying-out of the coins, the slot machine control unit 11a sends a JP data reset message to the master control unit 2 through the slave control unit 6a. This JP data reset message includes a command code "&H34" representing reset of data in the RAM 23 of the master control unit 2. After receiving the JP data reset message, the master control unit 2, for confirmation, a JP reset confirmation message to the slot machine control unit 5a and then, the slot machine control unit 5a sends a JP reset response message to the master control unit 2. When the master control unit 2 is received the JP reset response message, the master control unit 2 finally clears the data in the RAM 23 which represents the accumulated number of inserted coins, causing the indicated value to be zero on the indicating device 13.

As described before, if no response message in response of a message sent from the master control unit 2 has been received from any of slave units 6a to 6z for a pre-fixed time due to cable disconnection or trouble of a communication unit, the same message is sent from the master control unit 2, avoiding interruption of communication, by effecting the second communication unit 17 instead of the first communication unit 16, passing the looped communication circuit in reverse direction.

Because usually the probability of occurrence of JP hits is determined to be extremely small, next JP hit scarcely ocuurs immediatly after a JP hit. Accordingly, the total number of coins inserted in all of the slot machines becomes sufficiently large. However, it is to be noted that the next JP hit can rarely occur immediately after a JP hit. In this case, the total number of inserted coins is so small that the number of coins to be paid out is not suitable for a JP hit, the greatest hit. Therefore, when the number of coins to be paid out according to the total number of inserted coins is smaller than a predetermined number, the predetermined number of coins is actually paid out.

In this embodiment, a message is transferred to

the next stage of a slave unit even if the message is received by a slave unit having an address specified by the address code in the message. However, the message may not be necessarily transferred to the next stage of the slave unit. In this case, one of the first and second communication units 16 and 17 can be in rest state. Though an optical fiber cable is used in the embodiment, only single optical fiber may be used because messages consist of serial light signal. Further, instead of the optical communication system, conventional electrical communication system may be used, in this case a communication cable comprising data bus, control signal lines and so forth can be used.

Further, this intercommunication system may be used for another uses, not limited to only the JP processing, for acquisition of data such as the kind and number of hits for all slot machines or the number of coins stored in each of the slot machines for preparation of paying-out.

Moreover, the present invention can be applied to other kinds of apparatus such as pinball machine.

Although only one embodiment of the invention has been disclosed and described, it is apparent that other embodiments and modification of the invention are possible.

Claims

1. A communication method in which intercommunication of messages is made between a master control unit (2) having a first communication unit (16) and a plurality of apparatuses (6a-6z), comprising the steps of:
connecting all of said apparatuses (6a-6z) in series via first communication lines (10a);
connecting a first apparatus (6a) of said apparatuses with said first communication unit (16) via a second communication line (10b); and
transferring said message from one of said apparatus (6) to said another one of the apparatuses which is adjacent thereto in the communication path so as to make said intercommunication between said master control unit (2) and any arbitrary one of said apparatuses (6a-6z).

2. A communication method as claimed in claim 1, further comprising the steps of:
connecting a second communication unit (17) of said master control unit with a last apparatus (6z) of said apparatuses through a third communication line (10b); and
operating one of said first and second communication units (16, 17) so as to make said intercommunication.

3. A communication method as claimed in claim 2, wherein when it is impossible to continue said intercommunication with one of said apparatuses (6a-6z) operating only one of said first and second communication units (16, 17) due to line trouble, the other of said first and second communication units (16, 17) is operated so as to communicate with said one of the apparatuses (6a-6z).

4. A communication method as claimed in claim 3, wherein a decision as to whether or not the cause of said impossibility of an attempted intercommunication is line trouble is performed by monitoring whether said master control unit (z) receives a message as a response from an apparatus (6a-6z) which has received a message from said master control unit (2) within a fixed time, said monitoring being made by using that one of the communication units (16, 17) which is not operated for that attempted intercommunication.

5. A communication method as claimed in any of claims 1 to 4, further comprising the steps of:
providing an address to each of said apparatuses (6a-6z), said addresses differing from each other; and
including an address code in said message to specify one apparatus (6a-6z) only which makes said intercommunication.

6. A communication system for making intercommunication of messages with a plurality of apparatuses (6a-6z) which are able to transmit and receive said messages, comprising:
a master control unit (2);
a first communication unit (16) provided in said master control unit (2), said messages being transmitted and received through said first communication unit (16);
a plurality of first communication lines (10a) via which said apparatuses (6a-6z) are connected serially; and
a second communication line (10b) via which one end apparatus (6a) of said serially-connected apparatuses (6a-6z) and said first communication unit (2) are connected.

7. A communication system as claimed in claim 6, further comprising:
a second communication unit (17) provided in said master control unit (2), said messages being transmitted and received through said second communication unit (17); and
a third communication line (10b) through which the other end apparatus (6z) of said serially-connected apparatuses (6a-6z) and said second communication unit (17) are connected.

8. A communication system as claimed in claim 7, further comprising:
a switching unit (19) which is provided in said master control unit (2) so as to make either one of said first and second communication units (16, 17) operative.

9. A communication system as claimed in claim 8, further comprising:
a monitoring unit (18) which is provided in the master control unit (2) for monitoring said intercommunication and for making the other of said first and second communication units (16, 17) effective when said monitoring unit (18) detects that abnormality of said intercommunication has occurred.

10. A communication system as claimed in any of claims 6 to 9, wherein an address is provided to each of said apparatuses (6a-6z) and each of

said message if provided with an address code representing an address so that each of said messages is exchanged between said master control unit (2) and only one of said apparatuses (6a-6z), said addresses differing from each other.

11. A communication system as claimed in claim 10, wherein each of said apparatuses (6a-6z) is a slave unit having third and fourth communication units for transmitting and receiving said message.

12. A communication system as claimed in claim 11, said first and second communication units (16, 17) of said master control unit (2) and each of said slave units are provided with a transmitting device (27a) and a receiving device (26a), and said first, second and third communication lines comprise a transmitting line and receiving line.

13. A communication system for making intercommunication between a master control unit (2) and a plurality of slave units (6a-6z), each of said slave units (6a-6z) is provided in each of apparatus, comprising:

first and second communication units (16, 17) which are provided in said master control unit (2), each of said first and second communication units (16, 17) having a transmitting device for transmitting first messages and a receiving device for receiving second messages from each of said slave units (6a-6z);

third and fourth communication units (26, 27) which are provided in each of said slave units, each of said third and fourth communication units having a transmitting device for transmitting first message and a receiving device for receiving second messages from each of said slave units; and

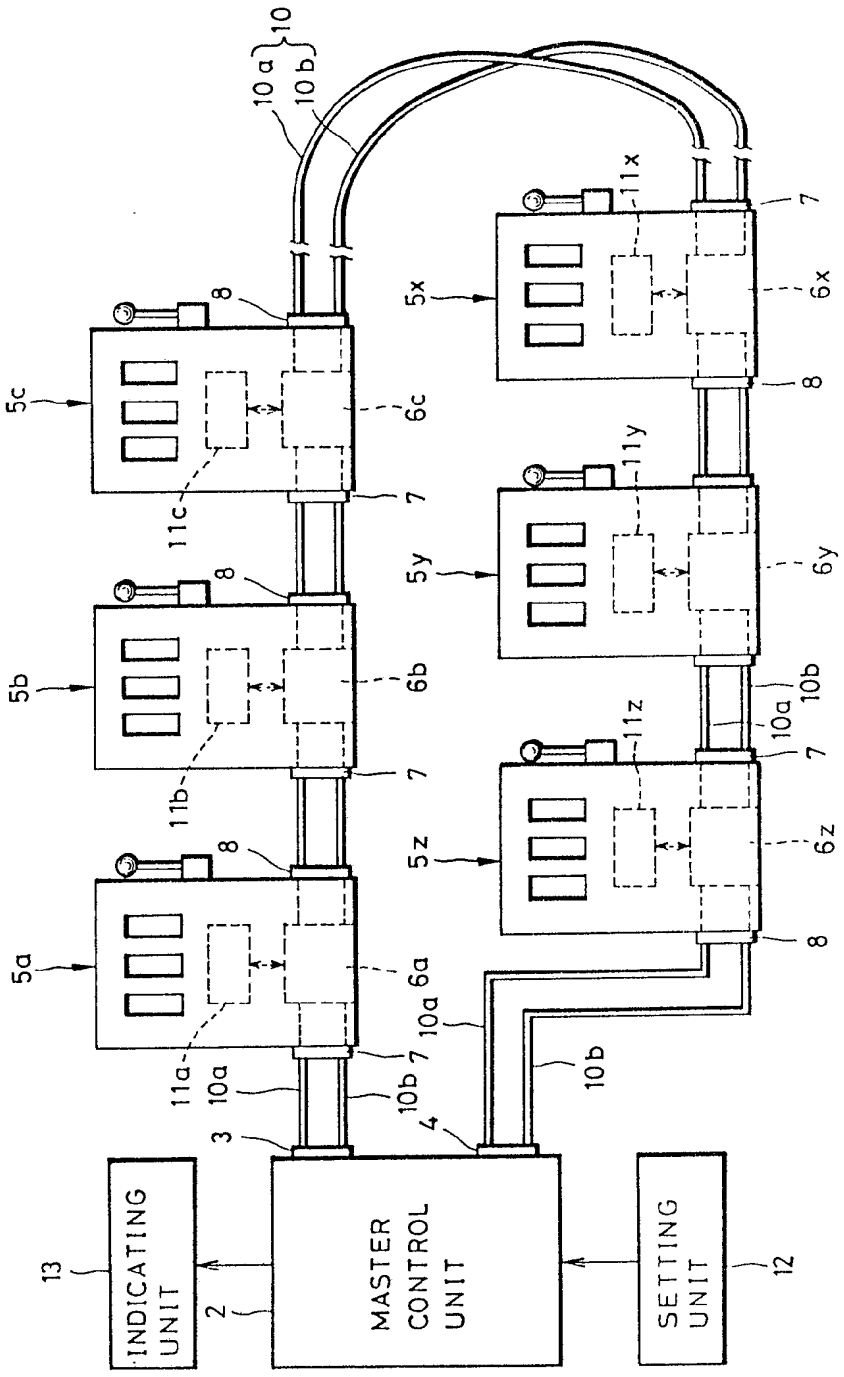
two communication lines (10a, 10b) for making a looped circuit of said master control unit (2) and said slave units (6a-6z), said communication lines being connected with said first, second, third and fourth communication systems.

14. A communication system as claimed in claim 13, wherein said master control unit (2) includes means (19) for making one of said first and second communication unit provided in said master control unit effective in normal communication, and for making said first and second communication units provided in said master control unit effective alternatively in abnormal communication so as to continue said intercommunication without interruption.

15. A communication system as claimed in claim, wherein each of said first, second, third and fourth communication units is provided with a light-emitting device and a light-receiving device for optical communication, and said communication lines are optical fibre cables.

16. A communication system as claimed in claim 15, said apparatuses are associated with respective slot machines.

FIG. 1


10
10a
10b
5a
5b
5c
5x
5y
5z
6a
6b
6c
6x
6y
6z
7
8
11a
11b
11c
11x
11y
11z
3
4
2
13
12
INDICATING UNIT
MASTER CONTROL UNIT
SETTING UNIT

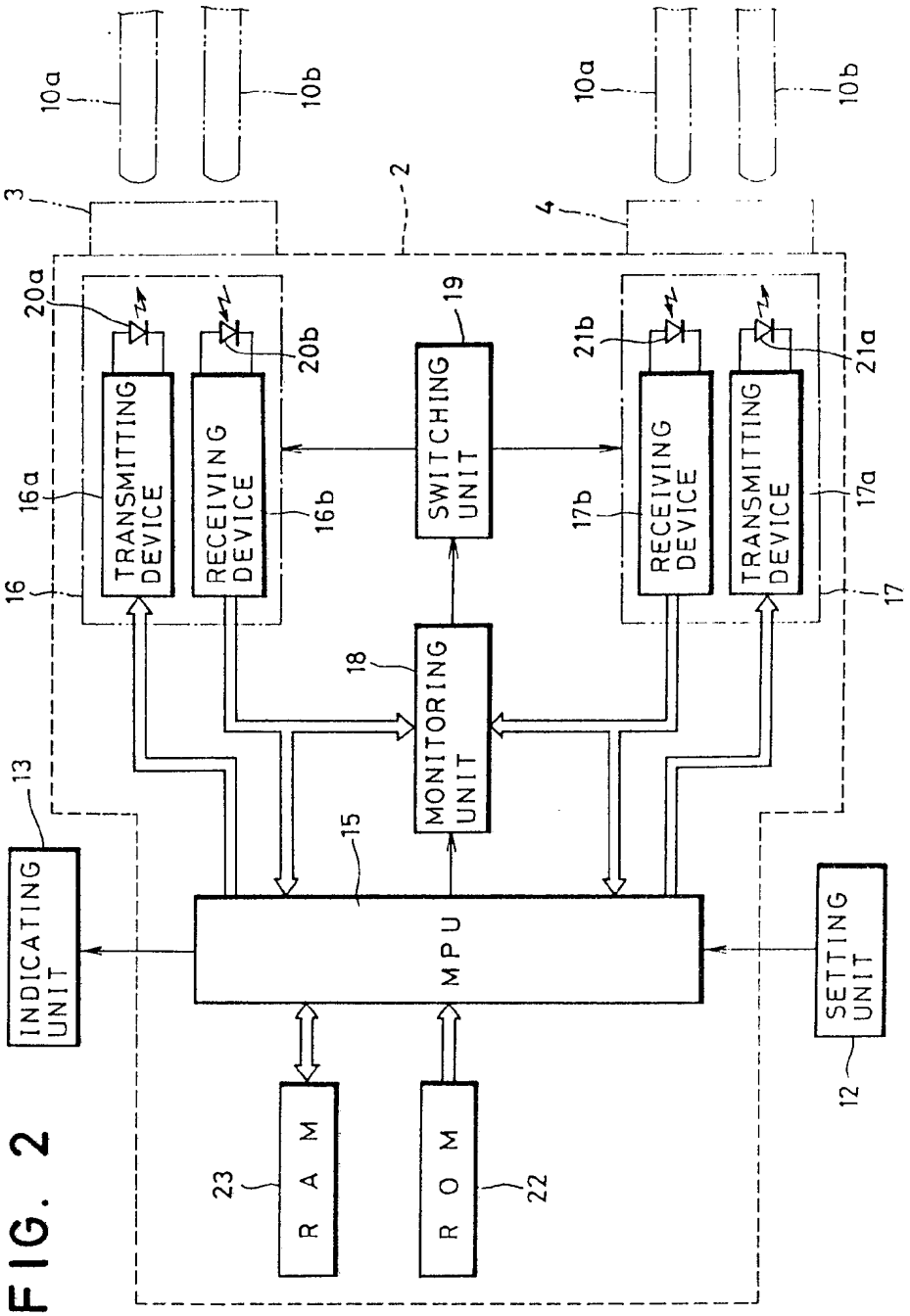

10a
10b
10a
10b
3
2
4
20a
20b
19
21b
21a
TRANSMITTING DEVICE
RECEIVING DEVICE
SWITCHING UNIT
RECEIVING DEVICE
TRANSMITTING DEVICE
16a
16b
17b
17a
16
17
18
MONITORING UNIT
13
15
INDICATING UNIT
MPU
SETTING UNIT
12
23
R A M
R O M
22

FIG. 2

FIG. 3

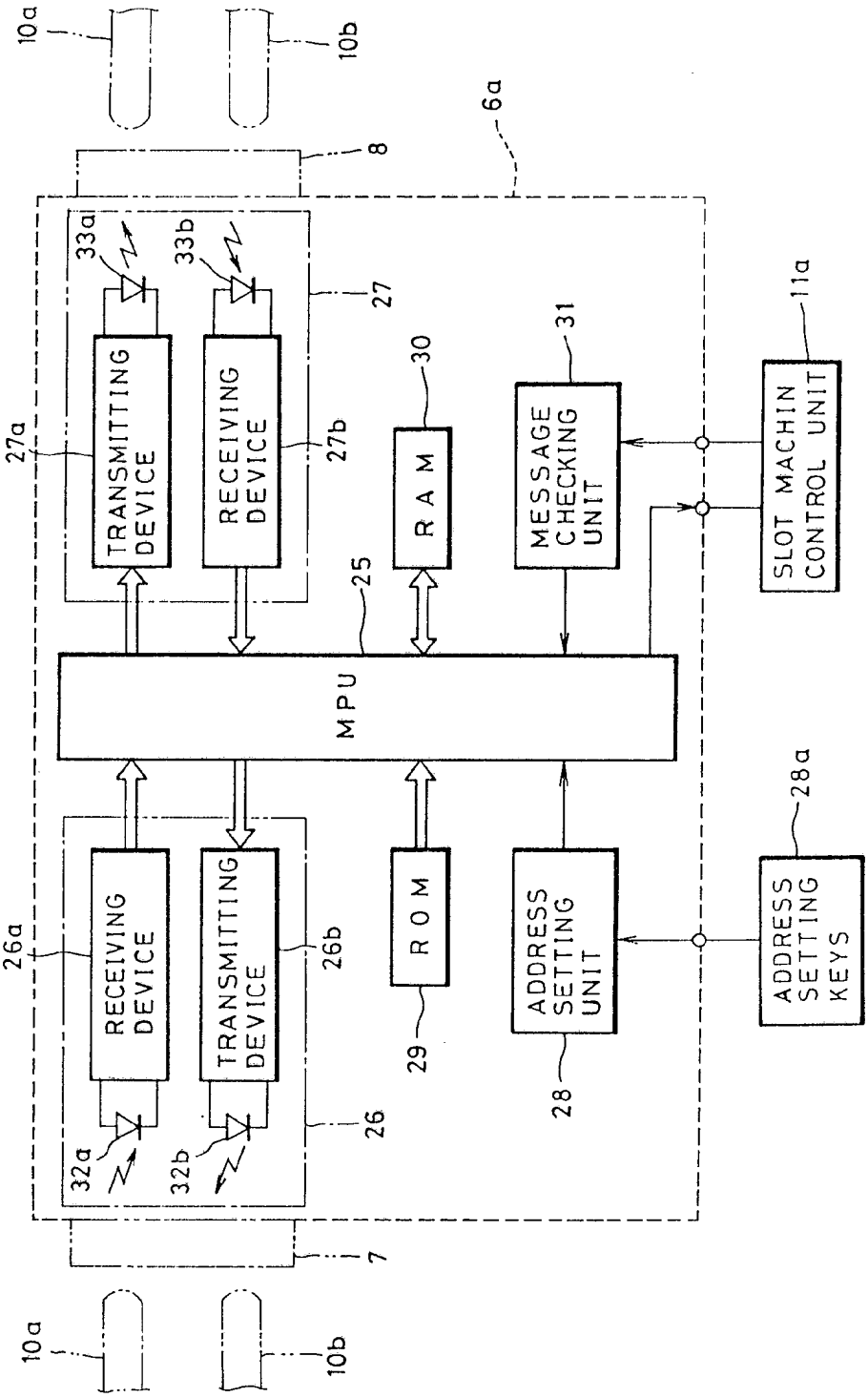

10a
10b
6a
8
33a
33b
27
TRANSMITTING DEVICE
RECEIVING DEVICE
27a
27b
30
R A M
31
MESSAGE CHECKING UNIT
11a
SLOT MACHIN CONTROL UNIT
25
M P U
RECEIVING DEVICE
TRANSMITTING DEVICE
26a
26b
R O M
29
ADDRESS SETTING UNIT
28
28a
ADDRESS SETTING KEYS
32a
32b
26
7
10a
10b

FIG. 4

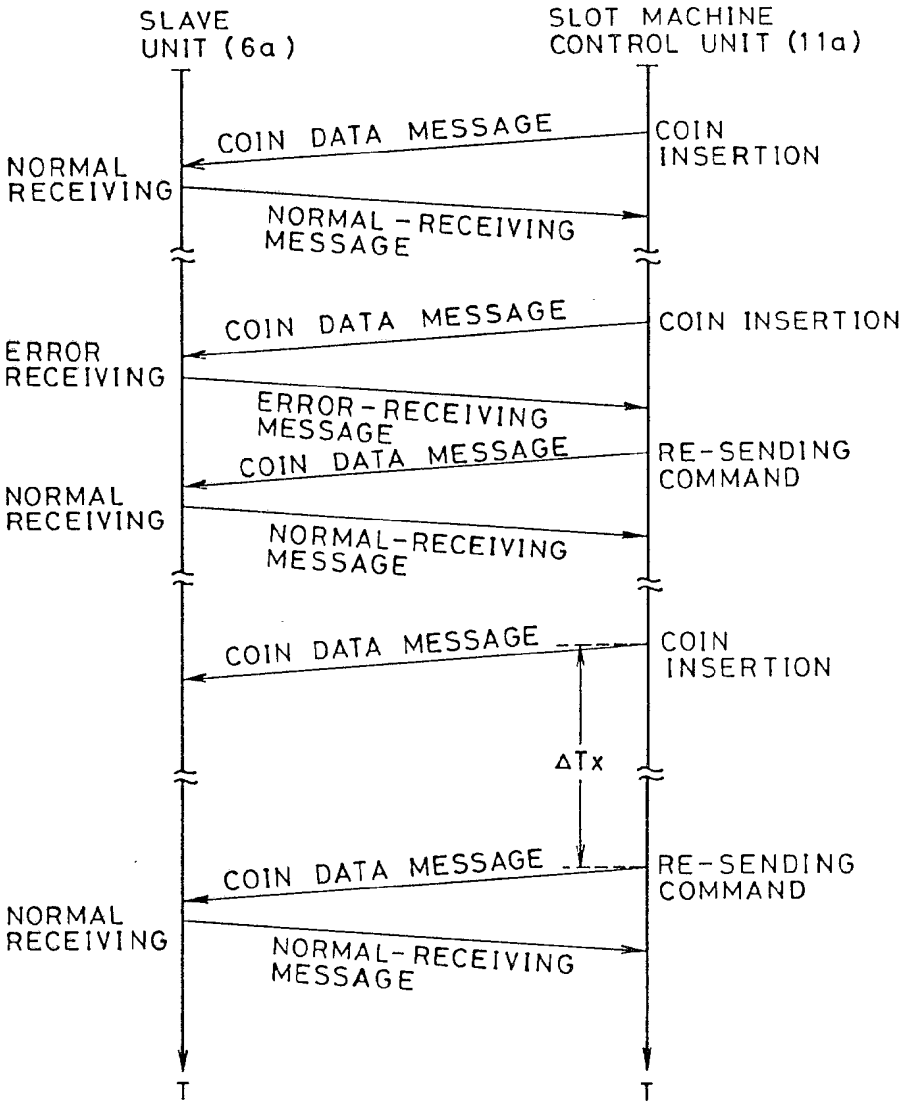

SLAVE UNIT (6a)
SLOT MACHINE CONTROL UNIT (11a)
COIN DATA MESSAGE
COIN INSERTION
NORMAL RECEIVING
NORMAL-RECEIVING MESSAGE
COIN DATA MESSAGE
COIN INSERTION
ERROR RECEIVING
ERROR-RECEIVING MESSAGE
COIN DATA MESSAGE
RE-SENDING COMMAND
NORMAL RECEIVING
NORMAL-RECEIVING MESSAGE
COIN DATA MESSAGE
COIN INSERTION
ΔTx
COIN DATA MESSAGE
RE-SENDING COMMAND
NORMAL RECEIVING
NORMAL-RECEIVING MESSAGE
T
T

FIG. 5

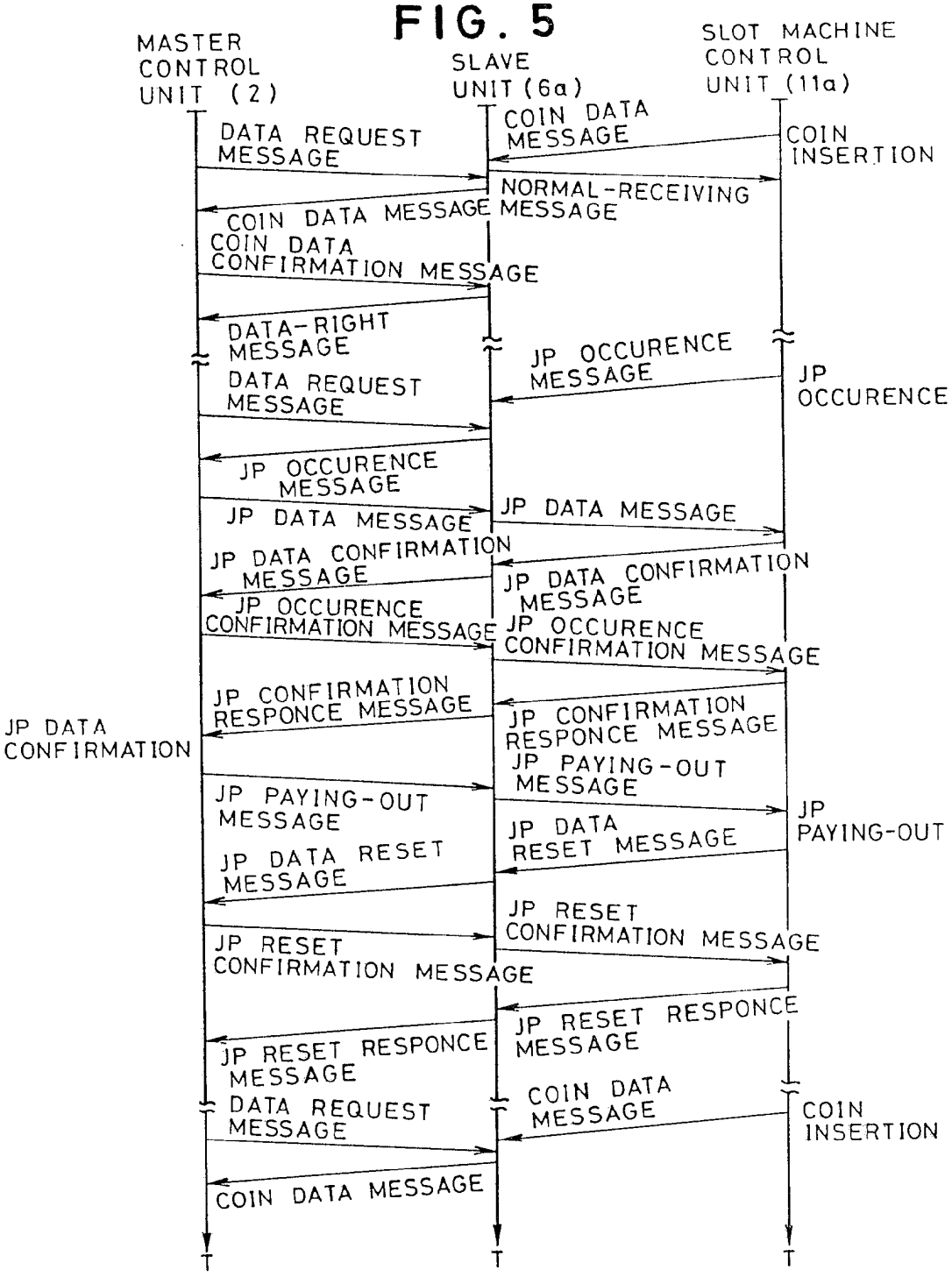

MASTER CONTROL UNIT (2)
SLAVE UNIT (6a)
SLOT MACHINE CONTROL UNIT (11a)
COIN DATA MESSAGE
COIN INSERTION
DATA REQUEST MESSAGE
NORMAL-RECEIVING MESSAGE
COIN DATA MESSAGE
COIN DATA CONFIRMATION MESSAGE
DATA-RIGHT MESSAGE
JP OCCURENCE MESSAGE
JP OCCURENCE
DATA REQUEST MESSAGE
JP OCCURENCE MESSAGE
JP DATA MESSAGE
JP DATA MESSAGE
JP DATA CONFIRMATION MESSAGE
JP DATA CONFIRMATION MESSAGE
JP OCCURENCE CONFIRMATION MESSAGE
JP OCCURENCE CONFIRMATION MESSAGE
JP CONFIRMATION RESPONCE MESSAGE
JP CONFIRMATION RESPONCE MESSAGE
JP DATA CONFIRMATION
JP PAYING-OUT MESSAGE
JP PAYING-OUT MESSAGE
JP DATA RESET MESSAGE
JP PAYING-OUT
JP DATA RESET MESSAGE
JP RESET CONFIRMATION MESSAGE
JP RESET CONFIRMATION MESSAGE
JP RESET RESPONCE MESSAGE
JP RESET RESPONCE MESSAGE
COIN DATA MESSAGE
DATA REQUEST MESSAGE
COIN INSERTION
COIN DATA MESSAGE

FIG. 6

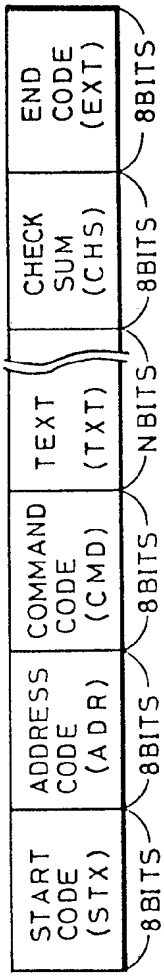


FIG. 7

	0	1	2	3	4	5
0			DATA REQUEST	COIN DATA		
1			JP DATA	JP OCCURENCE		
2	STX		JP DATA CONFIRMATION	JP DATA		
3	ETX		JP RESPONCE	JP RESPONCE		
4				JP RESET		
5				RESET RESPONCE		

FIG. 8

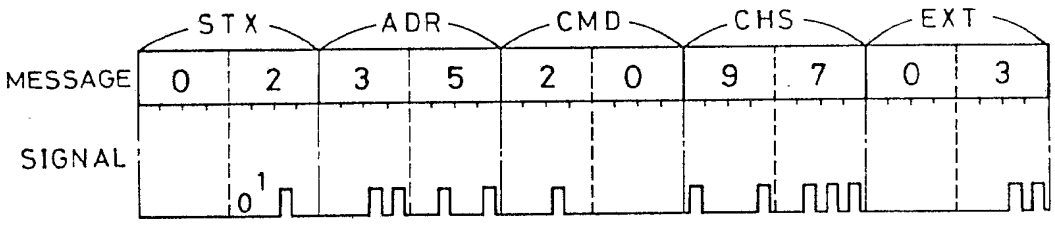


FIG. 9

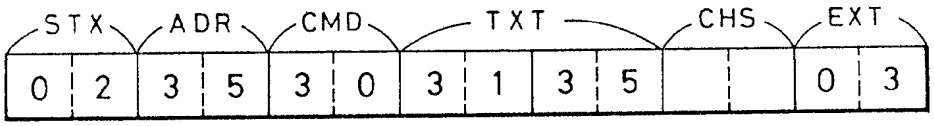


FIG. 11

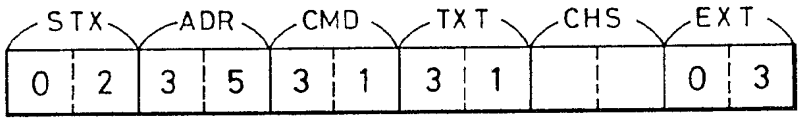


FIG. 12

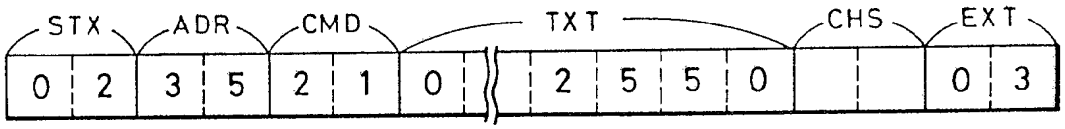
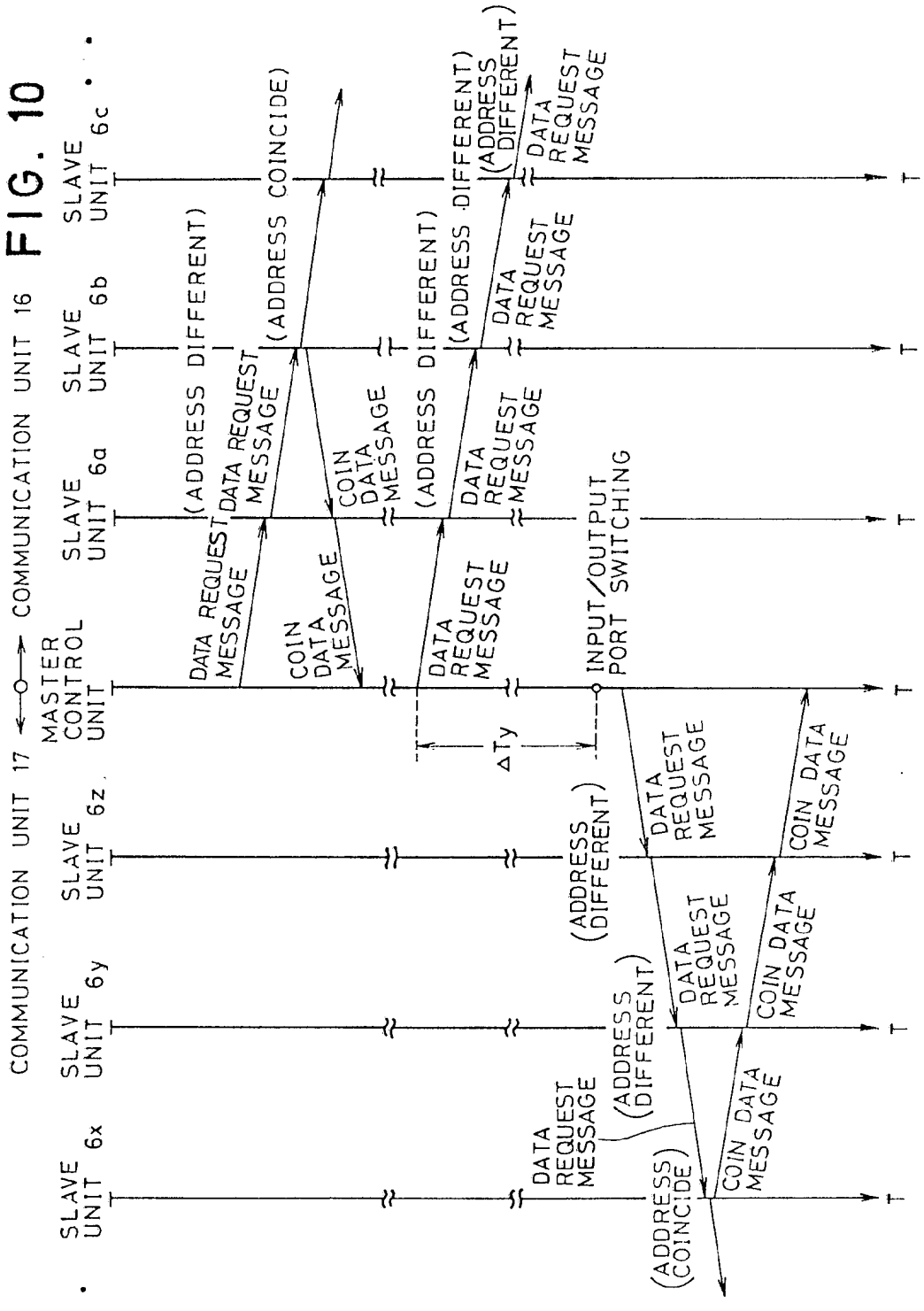


FIG. 10


COMMUNICATION UNIT 17
MASTER CONTROL UNIT
COMMUNICATION UNIT 16
SLAVE UNIT 6x
SLAVE UNIT 6y
SLAVE UNIT 6z
SLAVE UNIT 6a
SLAVE UNIT 6b
SLAVE UNIT 6c
DATA REQUEST MESSAGE
COIN DATA MESSAGE
(ADDRESS DIFFERENT)
(ADDRESS COINCIDE)
INPUT/OUTPUT PORT SWITCHING
ΔTy